DR80010

LED strip with integrated function decoder.

Manual

V1D
28-06-2021

Contents manual

Package contents.

1 LED strip with 12 warm-white LEDs.

1 Capacitor

WARRANTY All our products have a 24-month manufacturer's warranty. However, please read this manual carefully. Any damage to the product caused by failure to follow these instructions will invalidate the warranty. We are also not liable for any other damage caused by not following the instructions as stated in this manual. Installation of this LED strip is at your own risk. Digirails is not liable for damage caused to the wagon or other object. Digirails is also not liable for the lapsing of the guarantee of your wagon or other object.

Technical details

Format : 280 x 6 mm

Multiprotocol : (dcc, Motorola2)

POM Programming

Integrated prog. track current load (excl. extra outputs) : 28mA

Maximum load : 1 Amp

Analogue operation

The strip operates on DC or AC power at approx. 6.5 volts or more. The built-in current source maintains a near-constant light intensity at or above this voltage. If the strip is set up with a digital control unit and the desired settings are enabled before use on an analogue railway, the strip will remember these settings and exhibit them in analogue operation! The strip is supplied from the factory with bulb simulation and interior (F4) and signal lighting (F0) activated. The signal lighting is dependent on the direction of travel, also in analogue mode. This means that the strip can be used for analogue railways right out of the box!

Factory settings

The decoder can be reset to the factory settings by programming bit 3 active at CV8 (decimal 8). When starting up, the decoder will check whether bit 3 is programmed at CV8 and restore the factory settings.

Bit to decimal programming

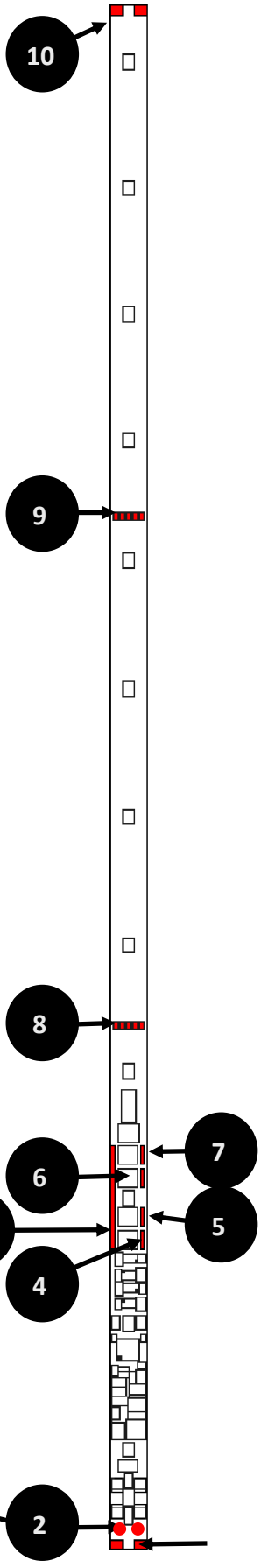
This manual refers to bit programming. Some systems only use decimal numbers for programming. Below you can see how to convert bits to decimal numbers.

* Some manufacturers such as Lenz© use bit values from 1- 8 instead of 0 -7.

Bit *		Value
0	=	1
1	=	2
2	=	4
3	=	8
4	=	16
5	=	32
6	=	64
7	=	128

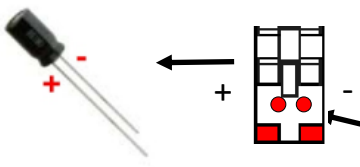
Product description

The LED strip is equipped with a function decoder and 12 warm-white LEDs. The advantage of an integrated function decoder is that the LED strip can be programmed with several special lighting effects. The LED strip also has four extra outputs, each with a maximum load of 500 mA. There is also a special built-in circuit to ensure all dcc control units are able to read and program the strip.



Connection details

(1) LED strip railway voltage connection
(2) Anti-flicker capacitor connection point
(3) Common positive (+) connection point
(4) Tail lighting (CV114 – F0)
(5) AUX2 (CV116 – F2)
(6) AUX1 (CV115 – F1)
(7) Head lighting (CV113 – F0)
(8) Shortening the LED strip (see page 4)
(9) Shortening the LED strip (see page 4)
(10) LED strip railway voltage connection



Shortening the LED strip

The strip is divided into 3 sections of 4 LEDs, when you shorten a section you need to make interconnections on the LED strip.

For example:
You want to shorten the ledstrip with 1 LED so that you have 11 LEDS left, you must connect the 2 left solder pads on the front of the strip.

If you want to shorten the LED strip with 2 LEDs so that you have 10 LEDs left, you must connect the 3 left solder pads from the front of the strip.

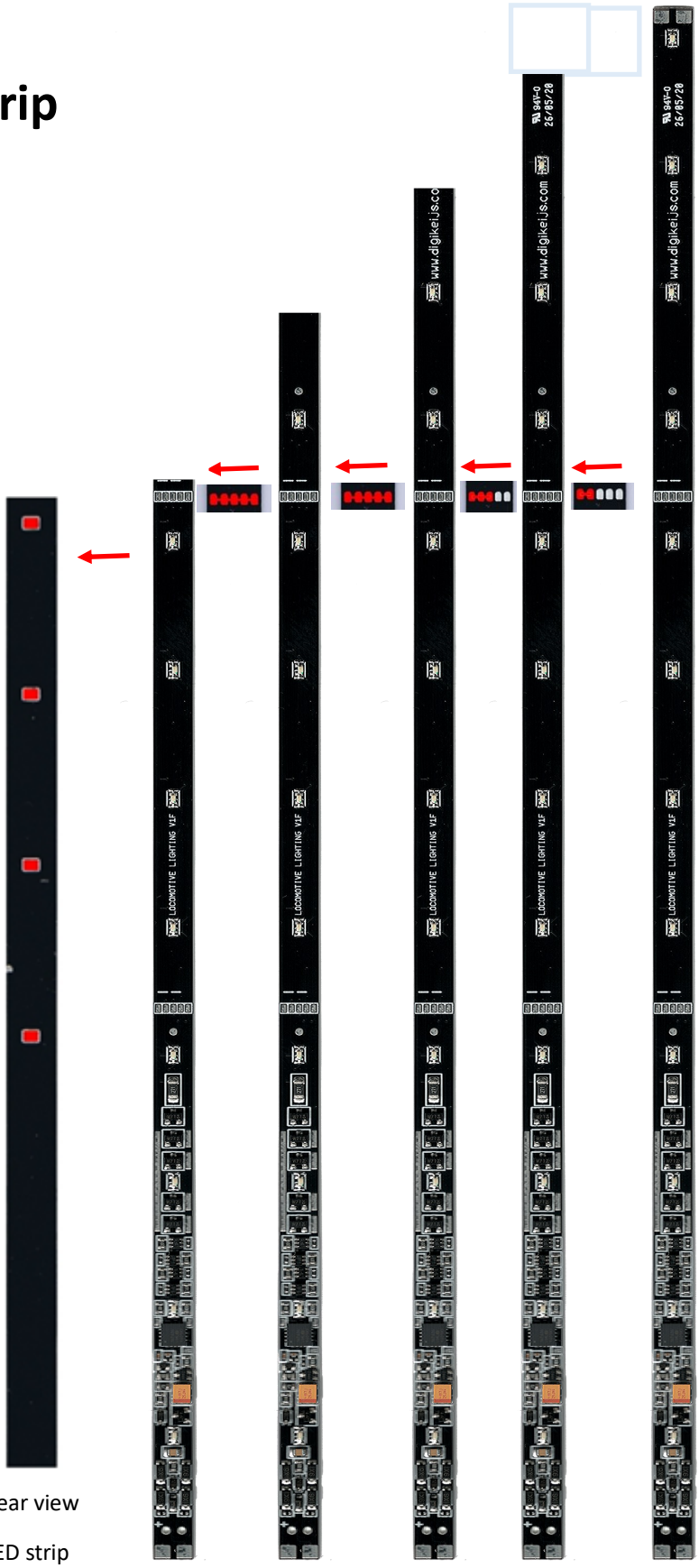
If you want to shorten the LED strip with 3 LEDs so that you have 9 LEDs left, you must connect the 4 left solder pads from the front of the strip.

If you want to shorten the LED strip by 4 LEDs so that you have 8 LEDs left, you must connect all the solder pads from the front of the strip.

This applies to all sections of the LED strip, however, if you remove more than 4 LEDs, you must also connect the corresponding solder pads at the back of the LED strip.

Shortening the LED strip

If you remove more than 4 LEDs, you must also connect the corres-ponding solder islands on the back of the LED strip. These islands are to be connected per section.



Rear view

LED strip

CV	CV definition	Range	Value
1	**Primary address** for the locomotive	1-127	3
7	**Version** of the decoder		10
8	**Manufacturer ID** value “8” leads to the factory settings being restored.		42
17	**Long address** high byte	192-255	0
18	**Long address** low byte	128-255	0
19	**Consist address** Extra address for controlling trains in a multiple configuration. “1” - “127” consist address active, normal direction, “129—”255” consist address active, reverse direction. “0” means that the consist address is turned off. 128 is an invalid value.	0-255	0
21	**Consist mode F1-F8** Functions that are controlled by the consist address.	0-255	248

Bit	Function	Value	Bit	Function	Value
0	Function F1	Def. 0 Val. 1	**4**	Function F5	Def. 1 V.16
1	Function F2	Def. 0 Val. 2	**5**	Function F6	Def. 1 V.32
2	Function F3	Def. 0 Val. 4	**6**	Function F7	Def. 1 V.64
3	Function F4	Def. 1 Val. 8	**7**	Function F8	Def. 1 V.128

22	**Consist mode FL** Functions that are controlled by the consist address.	0-3	3

Bit	Function	Value	Bit	Function	Value
0	Function FL Forward	Def. 1 Val. 1	**1**	Function FL Reverse	Def. 1 Val. 2

29	**Configuration details**		6

Bit	Function	Value
0	Locomotive direction: "0" = normal, "1" = reverse. This bit controls the locomotive's forward and backward direction in digital mode only. Direction-sensitive functions, such as headlights (FL and FR), will also be reversed so that they match the loco-motive's new forward direction	Def. 0 Val. 1
1	Speed steps in DCC. "0" = 14 steps "1" = 28/128 steps	Def. 1
2	Analogue detection “1” = analogue detection enabled	Def. 1
5	"0" = one byte addressing (address in CV1), "1" = two byte addressing (also known as extended addressing, address in CV17 and 18)	

CV	CV Definition	Range	Value
47	**Presets**	0 – 3	n/a

Bit	Function	Value	Bit	Function	Value
0	Bulb	0	2	Gas lamp	0
1	Fluorescent light	0	3	On - Off	0

48	**Set 117-120** This configuration variable (CV) sets the CVs 117-120 simultaneously. This is a write-only CV	See CV 117	n.a.
109	**PWM period** (pulse-width modulation) The resolution used by the internal PWM to manage effects and dimming values	1-255	23
111	**Fade speed** The speed with which the outputs configured to have a fade function fade in and out	1-255	10
112	**Flicker speed** The speed with which the outputs configured to flicker do so	1-255	128
113	**Output configuration "lighting for"** Function of the "lighting for" output (white on the basis of a combination of bit 5 and 7 results in Phase-B blinking. The broken light effect is not available while blinking).	0-255	15

Bit	Function	Value
0 - 3	**Light intensity / dimmer** Value 0 is completely dimmed. Value 15 is maximum light strength.	Def. 15 Val. 0-15
4	**Fade in and fade out effect.** Value 0 is off. Value 1 is on. Fade speed can be controlled with CV111.	Def. 0 Val. 0-16
5	**Flicker effect.** Waarde 0 is uit. Waarde 1 is aan. Knipper snelheid is regelbaar in CV112	Def. 0 Val. 0-32
6	**Random light start up.** Value 0 is off. Value 1 is on. Starting speed can be controlled in CV111. When combined with bit 4 (fade), the light starts with a flash before slowly fading in (gas lamp effect) Important: The light intensity value (bit 0-3) must be 14 or less.	Def. 0 Val. 0-64
7	**Broken light effect.** Value 0 is off. Value 1 is on. CV110 controls the speed with which randomly failing lights are simulated.	Def. 0 Val. 0-128

114	**“Lighting reverse”** - see CV 113.	0-255	31
115	**Configuration AUX1** - see CV 113.	0-255	31
116	**Configuration AUX2** - see CV 113.	0-255	31
117	**Configuration LED group** - see CV 113.	0-255	31
118	**Configuration LED group 2** - see CV 113.	0-255	31
119	**Configuration LED-group 3** - see CV 113.	0-255	31
120	**Configuration LED group 4** - see CV 113.	0-255	31
141 - 192	**Function mapping** **see page 14**	0-255	1

CV description—detailed

CV 109. This CV determines how many steps the effect generator takes to do an internal task. This includes the amount of dimming on all outputs. The default value of 23 indicates no dimming when the relevant output bits 0-3 are set to 15. A sensible maximum value is approx 38. This dims all (!) outputs by a factor of 0.6. A higher value will cause noticeable flickering. To create eg the fluorescent effect, this value is reduced to eg 15.

CV 111. For effects such as "Fade", this CV determines the time between fully on and fully off and vice versa. The default value of 10 sets the transition time to approx 0.75 seconds. Increasing the value lengthens this time. For the "random light start up" effect, this CV also determines the duration and speed of the flickering.

CV 112. This CV indicates the period of the flicker effect in units of approximately 6 milliseconds. The default setting of 128 thus represents about 750ms, about 1.3Hz.

Examples

Is this perhaps too much of a good thing? Then simply follow one of the example CV settings to create specific effects:

Flourescent light effect: CV 109 = 15, CV 111 = 40, CV 117-120 = 73
Random start up, combined with instant switch off.

Gas light: CV 109 = 25, CV 111 = 25, CV 117-120 = 94
Switch on with a flash, then smooth fade in ,
combined with smooth fade out.

Bulb : CV 109 = 23, CV 111 = 10, CV 117-120 = 31
Smooth on and off.

On-Off: CV 117-120 = 15

To make an output blink, add 32 to the above values. All outputs that have bit 5 on will blink in phase and at the same speed. Sometimes it is desirable to have an output blink at a different speed. To do this, add 128 + 32 = 160 to the previous values.

By cleverly combining these values, it is even possible to make a kind of disco light eg for a ski train buffet car!

PRESETS

CV47 This write-only CV automatically sets a number of standard effects.

PRESET 0 - BULB EFFECT
All LEDs will turn on and off smoothly with this preset.

PRESET 1 - FLOURESCENT LIGHT EFFECT
This preset causes the LED strip to simulate the way a fluroescent light turns on.

PRESET 2 - GAS LAMP EFFECT
This preset causes the LEDs to turn on with a flash and then turn on and off smoothly.

PRESET 3 - ON/OFF WITHOUT EFFECTS
This preset causes the LEDs to turn on and off without any special effects.

MULTIPLE UNIT TRAIN CONTROL

It might not be immediately clear why multiple unit train control (consist) is useful when it comes to train lighting. However, imagine you had 6 carriages coupled to a locomotive and that each carriage had its own (long) address. Turning on all of the lights on the train would be quite a chore.

Consist offers an elegant and simple solution:

- Give the carriages in a train a random (unused address) number from 1—127.
- Program **CV19** of all the carriages in the train to this number.
- Set **CV21** and **CV22** so that the functions to be switched at the same time have a ‘1 bit’.

Now you can, for example, switch all of the interior lights in a train on and off with one button. If you move a carriage to another train, you simply set **CV19** back to 0 (eg via POM)

Using this method, in some train control programs the entire train can be set to ‘control mode’, allowing the program to control the train’s funtions.

CV22 combined with multi unit train control can also set whether a carriage's tail lights should be controlled. Setting the bit for FLF and FLR in **CV22** to 1 in the train's rear carriage causes the tail lights to switch with the light funtion. All other carriages have a 0 in the same bits.

SKI TRAIN:

CV 109 = 15, CV 111 = 1, CV 117/119 = 234,
CV 118/120 = 106
This causes the LED groups to flash opposingly in groups of two at quite a high frequency, combined with random turning on and off. There are of course many other possibilities. Experiment with the different CVs and your imagination is the limit!

	CV 109	CV 111	CV 117	CV 118	CV 119	CV 120
Fluroescent light effect	15	40	73	73	73	73
Gas light	25	25	73	73	73	73
Bulb	23	10	73	73	73	73
On-off			15	15	15	15
Disco light	15	1	234	106	234	106

DIMMING LIGHTING

The dimming of lighting can be set by function output.
(CV113 - CV120)

Example with lights on at 100%:
Head lights CV113 has bit 0 - 3 active (decimal value 15)

Example with lights on at 50%:
Head lights CV113 has bit 0 - 2 active (decimal value 7)

See page 2 for more information about converting bit and decimal values.

FUNCTION MAPPING

Using function mapping, it is possible to assign an output on the decoder to a function key on the control unit.

Example:
Standard setting: AUX1 on function key 1 – CV147 = bit 2 on decimal value 4 (bit 2 active)
In this example AUX1 is switchable via F1 and is only on when the direction of travel is forwards.

Adjusted setting: AUX1 on function key 3 – CV156 = bit 2 on decimal value 4 (bit 2 active)
With the adjusted setting, AUX1 is switchable via function key F3.

Important! Bit 2 in CV147 must be set to 0. Otherwise both F1 and F3 will switch AUX1.

The principle of function mapping:
Each CV value (CV141 - CV192) is equivalent to a function key on the control unit. One or more outputs (AUX) can be linked to each function key (CV value).

Be careful! The CVs are sensitive to the direction of travel. There are 2 CV values for each function key on the control unit (forward and reverse direction of travel).

Example 1 :

You want to switch AUX1 with function key F3 on your control unit.
Program value 8 in CV159 for ON status and value 8 in CV 162 for OFF status.

Example 2 :

You want to switch LEDGROUP 1 - 4 with function key F8.
Program in CV189 values (16 + 32 + 64 + 128 =) **240** for ON status and in CV192 value (16 + 32 + 64 + 128 =) **240** for OFF status of these 4 combined functions.

	Stand	CV	HEAD LIGHT	TAIL LIGHT	AUX 1	AUX 2	LED GROUP 1	LED GROUP 2	LED GROUP 3	LED GROUP 4
F 0	ON	**141**	**1**	2	4	8	16	32	64	128
	OFF	**144**	1	**2**	4	8	16	32	64	128
F 1	ON	**147**	1	2	**4**	8	16	32	64	128
	OFF	**150**	1	2	**4**	8	16	32	64	128
F 2	ON	**153**	1	2	4	**8**	16	32	64	128
	OFF	**156**	1	2	4	**8**	16	32	64	128
F 3	ON	**159**	1	2	4	8	16	32	64	128
	OFF	**162**	1	2	4	8	16	23	64	128
F 4	ON	**165**	1	2	4	8	**16**	**32**	**64**	**128**
	OFF	**168**	1	2	4	8	**16**	**32**	**64**	**128**
F 5	ON	**171**	1	2	4	8	**16**	32	64	128
	OFF	**174**	1	2	4	8	**16**	32	64	128
F 6	ON	**177**	1	2	4	8	16	**32**	64	128
	OFF	**180**	1	2	4	8	16	**32**	64	128
F 7	ON	**183**	1	2	4	8	16	32	**64**	128
	OFF	**186**	1	2	4	8	16	32	**64**	128
F 8	ON	**189**	1	2	4	8	16	32	64	**128**
	OFF	**192**	1	2	4	8	16	32	64	**128**

* The RED numbers are the standard function map settings when the LED strip is delivered.